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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/732,863	12/09/2003	Mason K. Harrup	B-214	8133

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EXAMINER	
POULOS, SANDRA K	

ART UNIT	PAPER NUMBER
1714	

DATE MAILED: 05/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/732,863	HARRUP ET AL.	
	Examiner	Art Unit	
	Sandra K. Poulos	1714	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 March 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-59* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-59* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. All outstanding rejections and objections except for those described below are overcome by applicant's amendment filed 3/03/06.

In light of the new grounds of rejection set forth below, the following action is **NON-FINAL**.

Claim Objections

2. Claim 1is objected to because of the following informalities: "selectee" should be "selected". Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-3, 7 are rejected under 35 U.S.C. 102(e) as being anticipated by Payzant et al in US 6,610,780.

Payzant discloses a networked polymer clay alloy wherein the polymer is used to enhance a product's water absorbency (col 1, lines 21-29). The clays are swelling clays such as montmorrilonite and silica, which have metal oxides components (col 6, line 59 to col 7, line 22). Metal complexing agents are used as additives, to form metal complexes and thereby sequestering metal ions (col 8, lines 6-25). When the clay is intercalated with monomer, the

composition is a nanocomposite (col 2, lines 13-24); it is formed from a homogeneous mixture (col 14, lines 39-40). The polymer-clay alloy has water absorbing and/or permeability properties that are desired for the intended use (col 14, lines 15-20).

Thus, Payzant anticipates the cited claims.

Claim Rejections - 35 USC § 103

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beuhler et al in US 4,636,314.

Beuhler discloses a thin film organic-inorganic membrane containing a polymer, a heteropoly acid or salt thereof, and a multiplicity of electrically conductive particles (abstract). The polymer is poly(vinyl alchol) (examples); the heteropoly acid or salt includes such compounds as ammonium molybdophosphate (col 4, lines 29-30; col 9, lines 39-44); the electrically conductive particles are inorganic oxides such as alumina (col 5, lines 46-52; example 2). There is a uniform and even distribution of the particles throughout the polymer blend (abstract; col 11, lines 48-50).

Beuhler is silent with respect to whether the membrane composition is a nanocomposite.

In paragraph 24 of applicant's current specification, it is disclosed that nanocomposites are characterized as a single phase, substantially homogeneous material that lack phase separation. Since the composition in Beuhler meets the criteria set forth for a nanocomposite, it would have been obvious to one of ordinary skill in the art that it was a nanocomposite rather

than a "macroscale composite" because it lacks phase separation that applicant discloses as typical of non-nanocomposite compositions.

6. Claims 1-3, 5, 7, 16-18, 20, 22, 31-34, 36, 38, 49, 52-53, 55, 57-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson et al (Synthesis, Characterization, and Ion Sequestration of Novel Nanocomposite Materials).

The discussion with respect to Polson in paragraph 5 in the Office action mailed 11/28/05 is incorporated herein by reference. Polson additionally discloses that the physical stabilization can be deliberately altered to adjust the properties of the composite to those required for subsurface applications. Although Polson does not explicitly disclose selecting a water permeability, it would have been obvious to one of ordinary skill in the art that selecting a water permeability is within the scope of "adjusting the properties of the composite".

Furthermore, it is noted that claims 1 and 16 are product-by-process claims and therefore "even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." See *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

The claims now recite that the water permeability is "selected". However, regardless of the selection process there would be a water permeability associated with the material, which could be any value, since there is no indication of what the water permeability is selected to be. Although the water permeability may not be chosen by someone, it would intrinsically still exist.

It is examiner's position that a PBR composed of the nanocomposite would have discrete particles of the nanocomposite so that it would be uniformly distributed throughout the membrane in order to avoid an asymmetrical barrier with lumps of nanocomposite which would not block the flow of contaminants to the extent that a homogeneous barrier with discrete particles would.

7. Claims 4, 6, 8, 19, 21, 30, 35, 37, 39, 54, 56, 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson as applied to claims 1-3, 5, 7, 16-18, 20, 22, 31-34, 36, 38, 49, 52-53, 55, 57-58 above, and further in view of Mann et al in US 2002/0121470 or Sebesta et al (Composite Ion Exchanger with Ammonium Molybdophosphate and its Properties).

The discussion with respect to Polson in paragraph 6 above is incorporated herein by reference. Polson discloses water-soluble organic polymers but is silent with respect to the specific polymer. Also, Polson discloses aminomolybdophosphate and other selective cesium capturing agents, but not specifically ammonium molybdphosphate.

Mann discloses a composite media suitable for facilitating removal of various ions from fluid streams (para 4). The material is able to remove ions such as cesium from water (para 23). Among the active components are ammonium molybdophosphate (AMP) (para 59). The matrix is substantially polyacrylonitrile (PAN) (abstract; para 25-26, 59, 63; claim 11).

Sebesta discloses a composite ion exchanger based on PAN and using AMP as the active component for cesium removal.

It would have been obvious to one of ordinary skill in the art to use PAN as the water soluble polymer because it is disclosed in the above references that PAN is a typical polymer used in composite ion exchangers for cesium removal. Furthermore, it would have been obvious to further use AMP as a cesium capturing agent in Polson. Polson is open to other

cesium capturing agents other than aminomolybdophosphate, and it is well settled that it is prima facie obvious to combine two ingredients, each of which is targeted by the prior art to be useful for the same purpose. *In re Lindner* 457 F,2d 506,509, 173 USPQ 356, 359 (CCPA 1972).

8. Claims 24-28, 44-48, and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson as applied to claims 1-3, 5, 7, 16-18, 20, 22, 31-34, 36, 38, 49, 52-53, 55, 57-58 above, and further in view of EPA/600/R-98/125 (Permeable Reactive Barrier Technologies for Contaminant Remediation).

The discussion with respect to Polson in paragraph 6 above is incorporated herein by reference. Polson does not go into detail with respect to where the permeable reactive barrier would be located.

EPA discloses a method of remediating groundwater through the use of a permeable reactive barrier (PBR) (pg 1). Figure 1 on page 1 shows how the PRB is used, and it is to be noted that Figure 1 is identical to Figure 6 of the current application, wherein it is disclosed that "Fig. 6 illustrates the use of the nanocomposite materials of the present invention to remediate contaminated groundwater." EPA discloses that PBRs are currently built with two basic configurations, the funnel-and-gate and the continuous PRB (pg 1). Both have required some degree of excavation and have been limited in depth (pg 1). Newer techniques for emplacing reactive media such as injection of slurries may serve to overcome some of the emplacement limitations (pg 1). The funnel and gate design uses impermeable walls to direct the plume flow to the PBR and has a greater impact on altering groundwater flow than does continuous PBR (pg 1). The type of continuous PBR most commonly installed is a trench that has been

excavated (pg 36). The trench is in the saturated zone (pg 37). There can be supporting trenches also installed (pg 38-39). The PRBs disclosed by the EPA are iron metal PRBs (pg 1).

It would have been obvious to one of ordinary skill in the art to use the PRB of Polson in the configurations given by the EPA because the given configurations have been in use and have shown successful decontamination of groundwater. One would expect reasonable success because both are PRBs used for removing contaminants from groundwater.

It would have been obvious to one of ordinary skill in the art to locate the PRB of Polson in an excavated trench in the groundwater table because it is the most commonly installed continuous trench. Additionally, it would have been obvious to use supporting trenches for support. Furthermore it would have been obvious to also use a funnel and gate configuration because the impermeable walls would direct the plume flow to the PBR so that the water could be treated.

9. Claims 23, 40, 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson as applied to claims 1-3, 5, 7, 16-18, 20, 22, 31-34, 36, 38, 49, 52-53, 55, 57-58 above, and further in view of Gilmore et al (US 2001/0033772).

The discussion with respect to Polson in paragraph 6 above is incorporated herein by reference. Polson does not disclose use of a PBR/nanocomposite in the vadose zone.

Gilmore discloses a reactive barrier for control of contaminated soil and groundwater (pg 1). A reactive barrier used to alleviate the spreading of groundwater contamination and vadose zone contamination (pg 1, paragraph 9-10). The contaminants that treated are metals, organics, and radionuclides (pg 2, paragraph 23). Gilmore discloses that there has also been some success in using reactive barriers in trenches (pg 1, paragraph 8).

It would have been obvious to one of ordinary skill in the art to use PBR/nanocomposite of Polson and apply it to the vadose zone as disclosed by Gilmore because both are used in remediation of contaminated water. One would expect reasonable success in using the PBR in the vadose zone because Gilmore discloses that reactive barriers can be used both in the vadose zone and in the groundwater.

10. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Polson as applied to claims 1-3, 5, 7, 16-18, 20, 22, 31-34, 36, 38, 49, 52-53, 55, 57-58 above, and further in view of Cantrell et al (US 5,857,810).

The discussion with respect to Polson in paragraph 6 above is incorporated herein by reference. Polson does not disclose the hydraulic conductivity of the PBR.

Cantrell discloses a chemical barrier injected into the groundwater as a suspension of solid particles or colloids in order to react with a contaminant plume (abstract; col 2). In column 4, Cantrell discloses that the hydraulic conductivity of a particular aquifer material is a linear function of the viscosity of the fluid passing through it. It is preferred that the hydraulic conductivity be substantially the same as the water alone (col 4).

It would have been obvious to one of ordinary skill in the art to use PBR of Polson and require a hydraulic conductivity as disclosed by Cantrelle because both are used in subsurface remediation of water. One would be motivated to do so because it enhances the ability of the porous media to remove contaminants. One would expect reasonable success in combining the references because the objective in both is to remove contaminants from groundwater via a barrier or membrane.

11. Claims 42, 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson as applied to claims 1-3, 5, 7, 16-18, 20, 22, 31-34, 36, 38, 49, 52-53, 55, 57-58, and further in view of Conner et al (US 5,728,302).

The discussion with respect to Polson in paragraph 6 above is incorporated herein by reference. Polson does not disclose injecting a slurry of the nanocomposite dispersed in a liquid in order to form a membrane in the ground.

Conner discloses a method of reducing the concentration of radioactive contaminants in fluids from subterranean reservoirs by directly introducing a solid sorbant into the reservoir as a solid component of a solid-liquid slurry using high pressure injection techniques (abstract; col 2, lines 39-67). The resin is mixed with an appropriate injection fluid and subsequently introduced into the reservoir (col 3, lines 28-35). The injection fluid is most commonly water (col 7, lines 14-22). Solid sorbants such as oxides of zirconium and titanium may be employed for removal of dissolved radionuclides (col 5, lines 27-35).

It would have been obvious to one of ordinary skill in the art to use the nanocomposite of Polson inject it into the ground as disclosed by Conner because both are used in subsurface remediation of groundwater. One would expect reasonable success because both compositions comprise a resin and oxide and remove contaminants from groundwater, thereby obtaining the invention as set forth in the presently cited claims.

12. Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson as applied to claims 1-3, 5, 7, 16-18, 20, 22, 31-34, 36, 38, 49, 52-53, 55, 57-58 above, and further in view of Novak et al (Simultaneous Interpenetrating Networks of Inorganic Glasses and Organic Polymers).

The discussion with respect to Polson in paragraph 6 above is incorporated herein by reference. The difference between Polson and the presently claimed invention is that Polson does not disclose metal alkoxides or solvating the polymer.

Novak discloses dissolving SiO_2 and polymers to form interpenetrating networks. Furthermore, silicon alkoxides can be used to eliminate the problem of shrinkage in nanocomposites. It would have been obvious to one of ordinary skill in the art to form an interpenetrating network of dissolved polymer and SiO_2 or a silicon alkoxide in the composition given by Polson because doing so gives better phase homogeneity between two chemically dissimilar phases. Additionally it would have been obvious to use a metal alkoxide to eliminate shrinkage in the nanocomposite.

13. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Polson in view of Novak as applied to claims 1-3, 5, 7, 9-11, 16-18, 20, 22, 31-34, 36, 38, 49, 52-53, 55, 57-58 above, and further in view of Wen et al (Organic/Inorganic Hybrid Network Materials by the Sol-Gel Approach).

The discussion with respect to Polson and Novak in paragraph 12 above is incorporated herein by reference.

The difference between Polson in view of Novak and the presently claimed invention is that tetraethylorthosilicate (TEOS) is not disclosed.

Wen discloses a nanocomposite organic/inorganic hybrid network that can be used as an adsorbent, comprising of metal alkoxides and polymers in a solvent (pg 1667-1668). Specific polymers are disclosed in Table 2, pg 1670. Wen discloses that TEOS is less reactive than other metal alkoxides and therefore is better for forming networks (pg 1669), thus it would have

been obvious to one of ordinary skill in the art to substitute TEOS for the metal alkoxide disclosed in Novak.

14. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polson in view of Novak and Wen as applied to claims 1-3, 5, 7, 9-12, 16-18, 20, 22, 31-34, 36, 38, 49, 52-53, 55, 57-58 above, and further in view of Sebesta et al (Composite Ion Exchanger with Ammonium Molybdophosphate and its Properties).

The discussion with respect to Polson, Novak, and Wen in paragraph 12-13 above is incorporated herein by reference. Polson discloses water-soluble organic polymers but is silent with respect to the specific polymer. Also, Polson discloses aminomolybdophosphate and other selective cesium capturing agents, but not specifically ammonium molybdphosphate.

Mann discloses a composite media suitable for facilitating removal of various ions from fluid streams (para 4). The material is able to remove ions such as cesium from water (para 23). Among the active components are ammonium molybdophosphate (AMP) (para 59). The matrix is substantially polyacrylonitrile (PAN) (abstract; para 25-26, 59, 63; claim 11).

Sebesta discloses a composite ion exchanger based on PAN and using AMP as the active component for cesium removal.

It would have been obvious to one of ordinary skill in the art to use PAN as the water soluble polymer because it is disclosed in the above references that PAN is a typical polymer used in composite ion exchangers for cesium removal. Furthermore, it would have been obvious to further use AMP as a cesium capturing agent in Polson. Polson is open to other cesium capturing agents other than aminomolybdophosphate, and it is well settled that it is prima facie obvious to combine two ingredients, each of which is targeted by the prior art to be

useful for the same purpose. *In re Lindner* 457 F,2d 506,509, 173 USPQ 356, 359 (CCPA 1972).

15. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Polson in view of Novak as applied to claims 1-3, 5, 7, 9-18, 20, 22, 31-34, 36, 38, 49, 52-53, 55, 57-58 above, and further in view of Conner et al (US 5,728,302).

The discussion with respect to Polson, Novak, and Wen in paragraph 12-13 above is incorporated herein by reference. Polson does not disclose injecting precursor materials of the nanocomposite dispersed in a liquid in order to form a membrane in the ground.

The discussion with respect to Conner in paragraph 11 above is incorporated herein by reference.

It would have been obvious to one of ordinary skill in the art to use the nanocomposite of Polson in view of Novak and Wen and inject it (the polymer, metal alkoxide (which is the inorganic precursor), and cesium capturing agent) into the ground as disclosed by Conner because both are used in subsurface remediation of groundwater. One would expect reasonable success because both compositions comprise a resin and oxide and remove contaminants from groundwater. The precursor materials are the metal alkoxide

Response to Arguments

16. Applicant's arguments filed 3/3/06 have been fully considered but they are not persuasive.

Applicant's arguments with respect to selecting the water permeability of the nanocomposite and the have been addressed in the above rejections (paragraph 6).

Regarding claim 9, (argument on pg 17-18) Novak does not teach away from using solvated polymer. In the ninth full paragraph, Novak discloses using "a stoichometric amount of water and corresponding polymerizable alcohol as the cosolvent".

Regarding claim 31 and 42, (argument on pg 18-19; 26) applicant argues Polson does not teach discrete particles. This argument has been addressed in last paragraph of rejection in paragraph 6 above.

Regarding claim 57, (argument on pg 19) applicant argues that Polson does not teach chemically binding the metal ion contaminant to the PBR. However, Polson teaches cesium *capturing* agents, and that the barrier is a permeable *reactive* barrier, so it would be expected to that the cesium is chemically bound to the PBR.

Regarding claim 41 (argument on pg 26), applicant argues that the references do not teach or suggest injecting precursor materials of a nanocomposite material into the ground to form a membrane. The new rejection in paragraph 15 above shows that the inorganic precursor material would have been obvious to inject into the ground to form a membrane, in view of Conner. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Conclusion

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Tranter et al (US 20050051492) discloses an adsorption medium includeing a polyacrylonitrile matrix and at least one metal oxide incorporated into the polyacrylonitrile matrix.

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sandra K. Poulos whose telephone number is (571) 272-6428. The examiner can normally be reached on M-F 7:30-4:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasu Jagannathan can be reached on (571) 272-1119. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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